

Working Draft - For TAC Discussion

Possible Technical Alternatives to Address Groundwater Depletion

Possible Technical Approaches	
Stormwater Capture & Recharge	Assess how much stormwater is potentially available and could be captured and recharged, optimal recharge locations, and facilities needed. Include flood management, habitat enhancement, and recreation elements.
Option 1 Assumptions	<p><i>Medium to large scale project(s) 100 to 200 acres total, 50-100 acres each?</i></p> <p>Possible location(s)</p> <p>Capture volume 250 – 1,000 AF/yr?</p> <p>Cost range \$</p> <p>Land purchase/easement \$</p> <p>Planning/Design \$</p> <p>Construction \$</p> <p>Schedule</p> <p>Cost/AF</p> <p>Facilities description:</p>
Option 2 Assumptions	<p><i>Agricultural distributed stormwater capture and recharge - ¼ to ½ acre each?</i></p> <p>Distributed across alluvial basin 20 locations?</p> <p>Capture volume 1-2 AF each, times 20 = 20-40 AF?</p> <p>Recharge volume 100-200 AFY?</p> <p>Recharge efficiency:</p> <p>Cost range \$</p> <p>Design/Construct \$</p> <p>Timing</p> <p>Cost/AF</p> <p>Facilities description:</p>
Option 3 Assumptions	<p><i>Domestic distributed stormwater capture and recharge (LID approach)</i></p> <p>Techniques include elements such as rain gardens and bioretention; vegetated swales, buffers, and strips; rain barrels and cisterns; permeable pavers; impervious surface reduction distributed across alluvial basin.</p> <p>Capture volume 10 AF = 325 gallons per household?</p> <p>Cost range \$</p> <p>\$ per household</p> <p>Timing</p> <p>Cost/AF</p> <p>Facilities description:</p> <p>45,000 / 4 = 11,000 residences?</p>

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Groundwater Banking	Bank imported Russian River in Sonoma Valley aquifers using wells. Evaluate how much Russian River water could potentially be banked, optimal banking locations, and the facilities needed.
<i>Option 1 Assumptions</i>	<p>Water Contractor facilities</p> <p>One to two wells each for City of Sonoma and Valley for the Moon Water District</p> <p>Distributed in areas of City and Valley of the Moon jurisdictional areas</p> <p>Recharge volume – 100-500 acre-feet per year?</p> <p>Recovery efficiency:</p> <p>Cost range</p> <p style="padding-left: 40px;">Capital cost - \$</p> <p style="padding-left: 40px;">O&M - \$/year including cost of the water to bank</p> <p>Schedule – Commence in 2020, assume 20 year period for estimating</p> <p>Cost/AF - \$</p> <p>Facilities description:</p>
<i>Option 2 Assumptions</i>	<p>Facilities or Deliveries outside Water Contractor areas (would require institutional change(s))</p> <p>One to two wells each for both of the depleted areas</p> <p>Distributed in the two groundwater depletion areas jurisdictional areas</p> <p>Recharge volume – 500-1,000 acre-feet per year</p> <p>Recovery efficiency:</p> <p>Cost range</p> <p style="padding-left: 40px;">Capital cost - \$</p> <p style="padding-left: 40px;">O&M - \$/year including cost of the water to bank</p> <p>Schedule – Commence in 2020, assume 20 year period for estimating</p> <p>Cost/AF - \$</p> <p>Facilities description:</p>
Increase Recycled Water	Increase the use of recycled for agricultural and landscape irrigation. Evaluate recycled water availability with Sonoma County Sanitation District build out as in lieu substitution to reduce groundwater demand, and optimal locations for application.
<i>Option 1 Assumptions</i>	<p>Agricultural (grape growing) irrigation and commercial landscape irrigation</p> <p>Build-out of Sonoma Valley Sanitation District plant recycled water piping</p> <p>Distributed in rural areas in southern Sonoma Valley</p> <p>Groundwater replacement volume 2,400 AF/yr</p> <p>Cost range \$</p> <p>Timing - build out by 2035</p> <p>Cost/AF \$</p> <p>Facilities description:</p>

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Increase Conservation	Increase rural area domestic and agricultural conservation. Assess potential for rural domestic conservation by reducing groundwater demand using tools and incentives available for urban area BMPs. Develop assumptions and evaluate potential additional viticulture and non-viticulture additional conservation amounts.
<i>Option 1 Assumptions</i>	<p>Rural domestic conservation</p> <p>Number of domestic residences and approximate savings per residence</p> <p>Distributed in rural areas in southern Sonoma Valley</p> <p>Groundwater replacement volume AF/yr</p> <p>Cost range</p> <p>Timing</p> <p>Cost/AF</p> <p>Description: Provide incentives for and funding for increasing conservation with water efficient appliances and fixtures, and improved water efficiency in landscape irrigation.</p>
<i>Option 2 Assumptions</i>	<p>Rural agricultural conservation</p> <p>Number of acres and approximate savings per acre</p> <p>Distributed in rural areas in southern Sonoma Valley</p> <p>Groundwater replacement volume AF/yr</p> <p>Cost range</p> <p>Timing</p> <p>Cost/AF</p> <p>Description:</p>
In Lieu Surface Water Substitution for Groundwater	Assess potential for expanding deliveries of surface water for in lieu substitution to meet groundwater demands, focused in areas of groundwater declines, considering conveyance and connection costs.
<i>Option 1 Assumptions</i>	<p>Rural agricultural and domestic wells replacement with imported surface water</p> <p>Number of wells to replace, cost of conveyance piping and connection</p> <p>Requires additional institution or institution expansion</p> <p>Distributed in rural areas in southern Sonoma Valley</p> <p>Groundwater replacement volume</p> <p>Cost range</p> <p>Timing</p> <p>Cost/AF</p> <p>Facilities description: Requires Storage and conveyance</p>
Pumping Redistribution	Assess potential for pumping redistribution to reduce demand in areas of groundwater level decline.
<i>Option 1 Assumptions</i>	<p>Rural pumpage redistributed from groundwater depletion areas</p> <p>Number of wells to replace, cost of conveyance piping and connection</p> <p>May require additional institution or institution expansion</p> <p>Cost range</p> <p>Timing</p> <p>Cost/AF</p> <p>Facilities description: Requires Conveyance and may require New Wells</p>

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Surface Water Storage	Assess the potential for small and large surface water storage ponds as temporary storage to offset a portion of agricultural groundwater demands.
<i>Option 1 Assumptions</i>	<p>Small surface storage ponds (No. acre/storage volume) - $\frac{1}{4}$ to $\frac{1}{2}$ acre each?</p> <p>Number of acres of storage ponds 20-40?</p> <p>Distributed in rural areas in southern Sonoma Valley</p> <p>Groundwater replacement volume 20 – 100 AF/yr ?</p> <p>1-5 AF each</p> <p>Cost range \$</p> <p>Design/Construct \$</p> <p>Timing</p> <p>Cost/AF</p> <p>Facilities description:</p>
<i>Option 2 Assumptions</i>	<p>Large surface storage ponds (No. acre/storage volume)</p> <p>Number of acres of storage ponds</p> <p>Distributed in rural areas in southern Sonoma Valley</p> <p>Groundwater replacement volume</p> <p>Cost range</p> <p>Timing</p> <p>Cost/AF</p> <p>Facilities description:</p>
Desalination	Consider different options and preliminary cost estimates for seawater desalination.
<i>Assumptions</i>	<p>Desalination plant with intake at San Pablo Bay</p> <p>Groundwater replacement volume</p> <p>Cost range – \$0.5-1.0B capital cost</p> <p>Cost/AF - \$+1,000 per AF</p>
Salinity Intrusion Mitigation	Consider different options and preliminary cost estimates for salinity intrusion mitigation.
<i>Option 1 Assumptions</i>	<p>Recharge wells along southern valley – recycled water and/or imported water</p> <p>Number of wells: 10 – 20 ?</p> <p>Distributed along southern Sonoma Valley, based on additional studies to locate wells</p> <p>Groundwater replacement volume 500-1,000AF</p> <p>Cost range Capitol</p> <p>Capitol cost per well \$ /well</p> <p>Conveyance</p> <p>Water use per well 50-100 AF/yr ?</p> <p>Water cost per year per well - \$?/well/yr</p> <p>O&M cost per well - \$?/well/yr</p> <p>Timing</p> <p>Cost/AF</p> <p>Facilities description:</p>
Baseline	
No Action Alternative	Considers the costs and consequences of not taking action – no changes to current practices.